



US006151744A

**United States Patent** [19]

Ohtani et al.

[11] **Patent Number:** 6,151,744[45] **Date of Patent:** Nov. 28, 2000[54] **METHOD OF AND APPARATUS FOR  
CLEANING SUBSTRATE**

5,651,160 7/1997 Yonemizu ..... 15/88.2

**FOREIGN PATENT DOCUMENTS**

695382 11/1994 Japan .

[75] **Inventors:** Masami Ohtani; Masahide Ikeda;  
Mitsuhiro Fujita; Joichi Nishimura,  
all of Kyoto, Japan[73] **Assignee:** Dainippon Screen Mfg. Co., Ltd.,  
Japan*Primary Examiner*—Randall E. Chin*Attorney, Agent, or Firm*—Ostrolenk, Faber, Gerb & Soffen,  
LLP[21] **Appl. No.:** 08/839,470[22] **Filed:** Apr. 14, 1997[30] **Foreign Application Priority Data**Apr. 15, 1996 [JP] Japan ..... 8-092608  
Aug. 22, 1996 [JP] Japan ..... 8-221260[51] **Int. Cl.<sup>7</sup>** ..... **A46B 13/02**[52] **U.S. Cl.** ..... **15/88.2; 15/21.1; 15/77**[58] **Field of Search** ..... 15/21.1, 77, 88.2,  
15/88.3, 88.4, 102[56] **References Cited****U.S. PATENT DOCUMENTS**5,351,360 10/1994 Suzuki ..... 15/102  
5,421,056 6/1995 Tateyama ..... 15/21.1  
5,485,644 1/1996 Shinbara ..... 15/21.1  
5,518,542 5/1996 Matsukawa ..... 15/88.2  
5,636,401 6/1997 Yonemizu ..... 15/21.1[57] **ABSTRACT**

A method of and apparatus for cleaning a substrate which require shorter processing time with high processing efficiency are disclosed. A cleaning brush pivots about a pivot axis between two positions. An ultrasonic cleaning nozzle pivots about a pivot axis between two positions. To perform a cleaning process, the cleaning brush and the ultrasonic cleaning nozzle are driven in accordance with a processing pattern previously produced by an operator. The processing pattern is produced so that the movement of the cleaning brush between two positions and the movement of the ultrasonic cleaning nozzle between two positions are not caused simultaneously. Any processing pattern desired by the operator may be produced if this requirement is satisfied. Execution of the cleaning process in accordance with the processing pattern allows cleaning of a substrate using the cleaning brush and the ultrasonic cleaning nozzle at the same time.

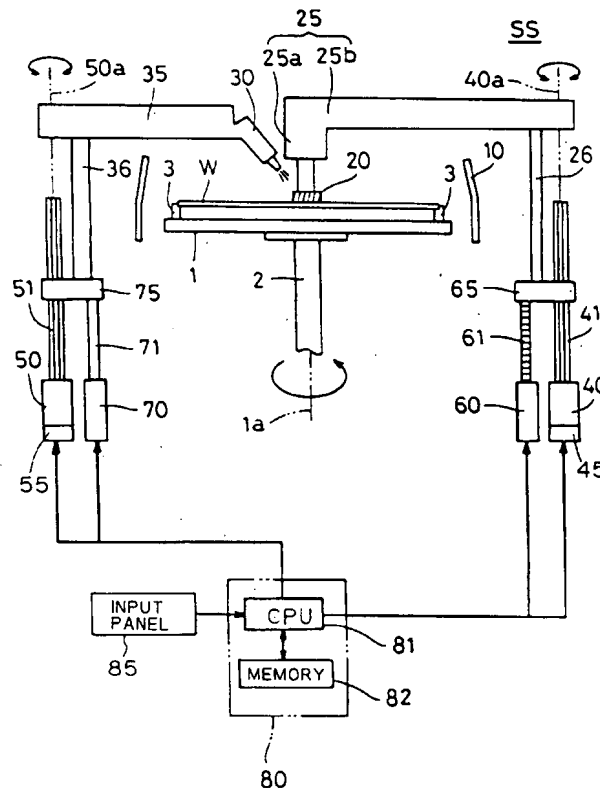
**4 Claims, 14 Drawing Sheets**

FIG. 1

